Sample file for CSE599s

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1 Introduction and notes on style

This sample shows how to use the cse599s style file. A few pointers on style:

- Please write your notes in complete sentences, including correct punctuation for called out equations. For example, the definition of regret is

$$\text{Regret} = \sum_{t=1}^{T} f_t(w_t) - \min_{u \in W} \sum_{t=1}^{T} f_t(u).$$

  Notice the period at the end of the above sentence!

- Use `\text` for text inside of equations, or better define a newcommand using `\operatorname`. Compare

$$Regret \qquad \text{to} \qquad \text{Regret}.$$

- Use the macros defined in this sample file, e.g., `\Regret`, `\argmin`, `\R`, etc.

- Try Googling "how to write math" for more good advice; this is good place to start: `http://erickson.sites.truman.edu/files/2012/04/guide1.pdf`.

2 Notation

We will typically use the following notation. Don't worry if you don't know what these all mean yet.

symbol	meaning
$t \in \{1, \dots, T\}$	There are T total rounds, and t is the index of the current round.
$w_t \in \mathbb{R}^n$	The feasible point selected by the algorithm on round t.
n	The dimension of the feasible set.
$w_{t,i} \in \mathbb{R}$	The ith coordinate of w_t, with $i \in \{1, \dots, n\}$.
$\mathcal{W} \subseteq \mathbb{R}^n$	A convex set of feasible points, from which w_t is chosen.
$f_t : \mathcal{W} \to \mathbb{R}$	A convex loss function selected by the adversary on round t.
$g_t \in \mathbb{R}^n$	The gradient of the current loss function at w_t, so $g_t = \nabla f_t(w_t)$.
$R : \mathcal{W} \to \mathbb{R}$	A strongly convex regularization function.
(x_t, y_t)	Feature vector x (usually in $\mathbb{R}^n$), and label $y \in \mathbb{R}$.
$h \in \mathcal{H}$	Hypothesis h from the set of possible hypotheses $\mathcal{H}$.
$\hat{y}_t$	Predicted label for x_t, for example $\hat{y}_t = h(x_t)$.

3 Online learning is fun

Theorem 1. *My algorithm works.*

Proof. I have proof. □

References

[1] N. Cesa-Bianchi and G. Lugosi, "Prediction, Learning, and Games", *Cambridge University Press*, 2006.